

of the anthers, are considered to indicate a closer relationship between *Welwitschia* and *Gnetum* than between *Welwitschia* and *Ephedra*.

Female Flowers.—Observations are recorded on the development of the macrosporangia and macrospores; the nature of the prothallial tubes is discussed, and the conclusion is that the true interpretation of the extraordinary behaviour of the fertile end of the *Welwitschia* prothallus will be founded upon a comparison with the corresponding portion of the embryo-sac of *Gnetum gnemon*.

The Araucarieæ, Recent and Extinct.

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(Abstract.)

The paper includes the following sections:—

I. *Introduction.*—The work was undertaken primarily with a view to ascertain whether the genera *Agathis* and *Araucaria* exhibit any of those features which are often associated with survivals from the past; our aim was to obtain an answer to the question: Do the existing Araucarieæ afford evidence of primitive characters or do they throw light on the phylogeny of the Araucarian phylum?

II. *Distribution.*—A brief account is given of the present distribution of existing species. *Agathis* is for the most part an island type. *Araucaria* is met with in the same area as that occupied by *Agathis*, but occurs also in Chili, S. Brazil, and Bolivia; the most widely spread species—*A. Cunninghamii*—extends over an area 900 miles long in Queensland and New South Wales, and is recorded from New Guinea. Five species of the genus have been described from New Caledonia.

III. *Generic Diagnosis and Synchrony of Species.*—In this section an attempt is made to give a concise account of the more striking characteristics of each species with a list of references to descriptions and records of the several types.

IV. *Seedlings.*—The seedlings described belong exclusively to the genus *Araucaria*; those of *A. Bidwillii* and *A. imbricata*, characterised by the swollen food-storing hypocotyl, are described in detail. In one case the stele

of the young root of *A. Bidwillii* was found to branch into two steles of equal size.

V and VI. *Root and Stem Anatomy*.—A general account is given of the characteristic features of the anatomy of both genera based partly on the work of others and in part on our own investigations.

VII and VIII. *Leaves and Leaf-traces*.—Several types of leaves are described with special reference to the relative abundance of centripetal and centrifugal xylem in the veins. The relation of the leaf-traces to the stem-wood is discussed at length, and some account is given of the behaviour of the traces during the growth in thickness of the stem.

IX. *Reproductive Shoots*.—This section includes an account of the male and female flowers of *Agathis* and *Araucaria*, special attention being paid to the course of the vascular bundles in the sporophylls. We are led to the conclusion that the cone-scales of the female flowers are simple structures homologous with foliage leaves. A description is given of the ovules and embryos of *Araucaria imbricata*.

X. *Fossil Araucarieæ*.—The records of fossil representatives of the two surviving genera are critically examined, and evidence is adduced in support of our contention that the Araucarieæ constitute one of the oldest sections of the Coniferales.

XI. *Phylogenetic Considerations and Conclusion*.—A comparison is made between the Araucarieæ and Lycopodiales; arguments are advanced in favour of the view that this group of Gymnosperms, unlike the Cycadales, was probably derived from Lycopodiaceous ancestors. We draw attention to the various characters in which the Araucarieæ differ from other members of the Coniferales, and suggest the advisability of giving more definite expression to their somewhat isolated position by substituting the designation Araucariales for Araucarieæ.

Our contention is that the general consent which has deservedly been given to the view that the Cycadales and Filicales are intimately connected by descent, may have the effect of inducing an attitude too prone to over-estimate the value of the arguments advanced in support of an extension of the idea of a filicinean ancestry to other sections of the Gymnosperms.
